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SASH GREENHOUSES

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SASH GREENHOUSES

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Covered by sashes but entered and managed in much the same way as a standard greenhouse, a sash greenhouse may be looked upon as intermediate between a hotbed and a standard greenhouse. Sash greenhouses are well adapted for uses of a more or less temporary nature and in situations where a forcing structure is needed only for a brief period for starting early plants, and for similar purposes.

Small sash greenhouses are fairly easy to construct and are not very expensive, especially if the grower already has on hand a supply of sashes. Such a greenhouse does not admit as much light as the sash-bar greenhouse, and ventilation is frequently a problem. A sash greenhouse is not adapted for growing to maturity such crops as cucumbers and tomatoes or cut flowers but is very satisfactory for growing lettuce, cabbage, cauliflower, celery, pepper, and tomato plants and certain ornamental bedding plants.

In addition to permitting a market or truck gardener to lengthen his crop season by setting out early plants as soon as conditions become favorable, a structure of this kind can frequently be used profitably for growing plants for sale. In many instances the entire cost of the house has been returned through increased receipts during a single season.

Types and Sizes

Sash greenhouses are usually constructed of 3- by 6-foot hotbed sashes with a wooden framework to support them. These structures may be of various sizes, but both width and length are made to suit the 3- by 6-foot sashes. In general, sash greenhouses are small, as the cost of large ones might easily be as much as that of standard sash-bar structures.

The lean-to sash greenhouse built with a roof of sashes against the south side of a building or a tight board fence is the simplest type. It may consist of one or more rows of sashes, which form the roof. These are supported by a low wall that carries 2 by 4 or 2 by 6 rafters upon which the sashes rest. When more than one row of sashes is used, the upper rows overlap the lower ones to make a water-tight roof. A foot to 16 inches of the portion of the roof next to the supporting building is usually covered with boards and roofing, thereby making the greenhouse wider. This method of construction interferes somewhat with the admission of light and often causes plants that are grown next to the wall to be spindling and inferior. For best results the entire roof structure should be of glass (fig. 1).

The sash greenhouse should be located in a place where it will be protected on the north side from winds. The ridge should be practically level and extend east and west. The structure may be of the even-span type; that is, with the ridge pole in the middle, and one, two, or more rows of sashes on each side (fig. 2); or it may be of the uneven-span type with the ridge pole to one side of the center line of the greenhouse, with a corresponding arrangement of the rows of sashes. For a sidehill location the uneven-span type is extensively used. This may have one row of sashes on the uphill and two or more rows on the downhill side of the ridge (fig. 3).

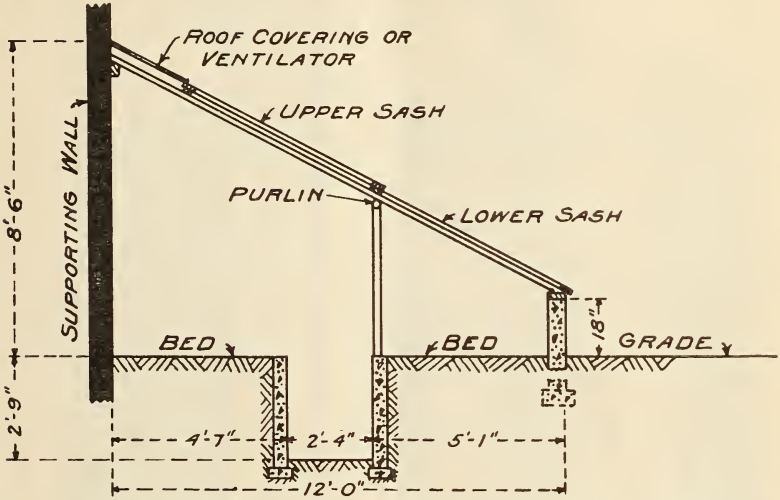

FIGURE 1.—Cross section of a lean-to sash greenhouse built on south side of a wall or building.

These houses are almost invariably built with low side walls, thereby making it necessary to excavate the walks in order to obtain headroom. In locations where good drainage is difficult to obtain it may be advisable to increase the height of the side walls instead of excavating the walks. In most cases the natural surface of the ground is employed for benches and the walks should be about 33 inches lower. As a rule, having low side walls with excavated walks lowers first costs and the expense of heating, but it may be more satisfactory to increase the height of the structure and build benches than to excavate in stony or poorly drained ground. It should also be remembered that in houses with excavated walks all soil and plants must be carried up and down steps.

Heating

Sash greenhouses may be heated by stoves, flue heaters, or steam or hot-water systems. When stoves are used they are usually placed in a shed at one end of the greenhouse, and the smoke pipe is carried below the ridge for the entire length of the house, where it ends in an outside chimney, or by merely attaching an elbow with two or three joints of stovepipe for a chimney. The stovepipe slopes upward from the stove to the chimney to give a draft. Fifty to

sixty feet is about the limit of length for a house heated by a stove located at one end, but sometimes such houses are made longer and heated by a stove at each end with the chimney in the middle. Stove-

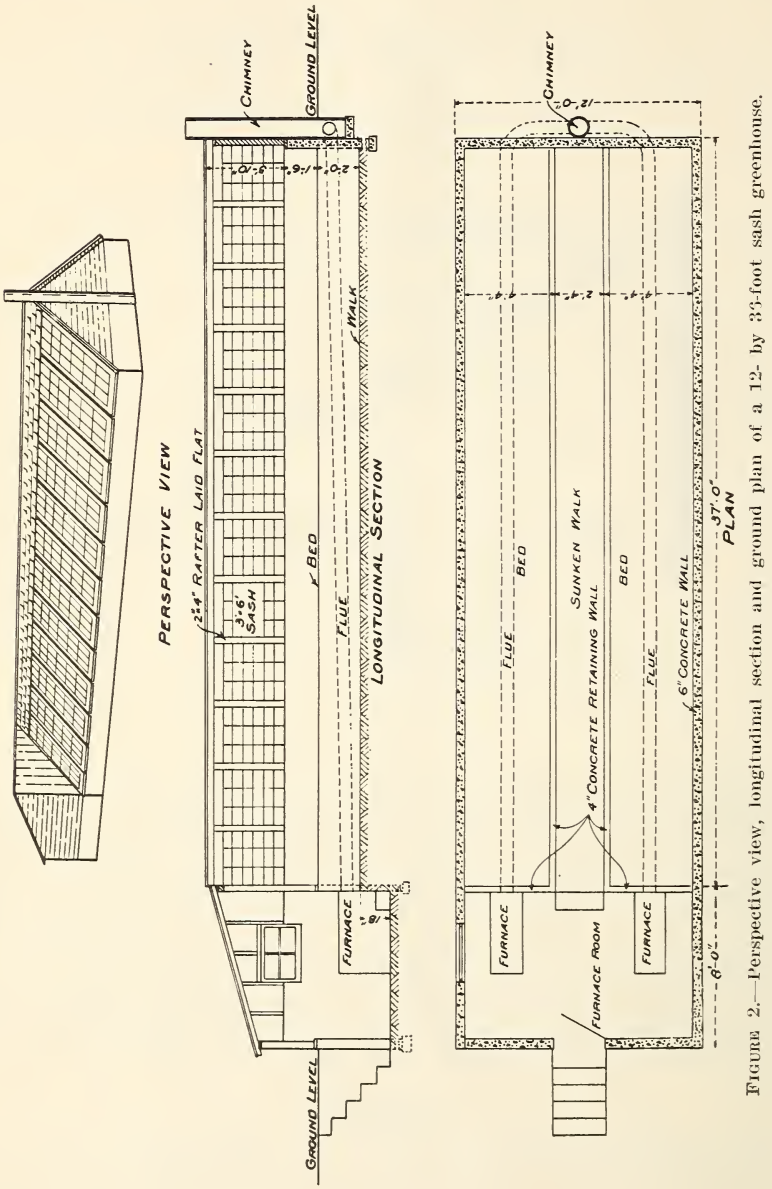

FIGURE 2.—Perspective view, longitudinal section and ground plan of a 12- by 33-foot sash greenhouse.

heated sash greenhouses are largely used for the starting of plants in the New York, Ohio, and Indiana celery districts.

Flue-heated sash greenhouses are in extensive use, but the present tendency is toward pipe heating. However, flue heating is satis-

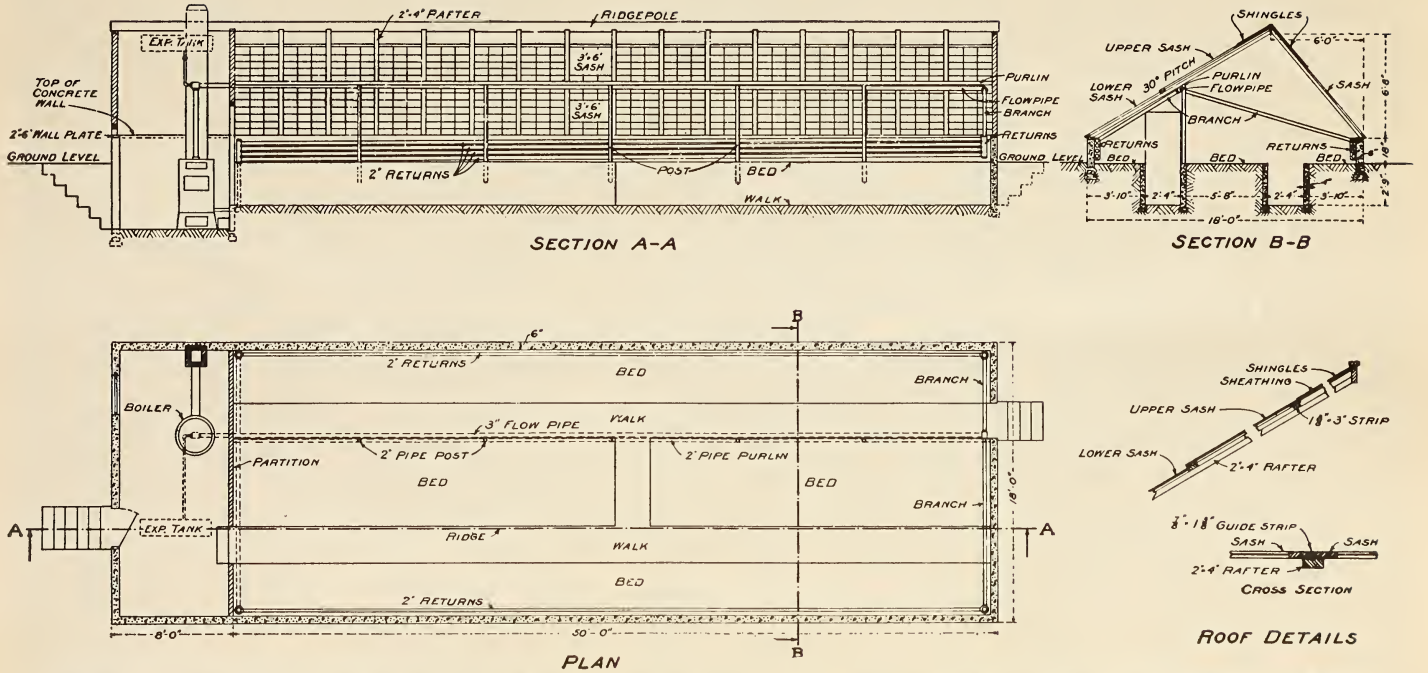

FIGURE 3.—Ground plan, longitudinal section, cross section, and roof detail of an 18-foot sash greenhouse of any desired length up to 60 feet.

factory and capable of yielding good results. In one type of flue heating the flues are buried in the soil and extend from the furnace at one end of the greenhouse to the chimney at the opposite end. In some cases the flues are built under raised benches. The furnace is usually located in a pit outside the greenhouse proper, and the flues are branched so that one or more may be placed under each bed. The furnace should be of generous size, especially when roots, stumps, or other rough material is to be used for fuel. For a sash greenhouse 12 feet wide and 50 to 60 feet long, with two beds, a furnace 18 inches above the grates, 18 inches wide, and 4 feet long will be amply large. The flues should be of 8-inch chimney tiles for the first 20 feet at least. Ordinary terra-cotta tiles with bell joints may be used for the remainder of the flues. The chimney may be of brick or of terra-cotta tiles. The general plan of the flue heaters is shown in figure 2.

The general plan of the hot-water heating systems is illustrated in figure 3. Flow pipes are usually placed overhead, with the returns located where convenience and uses of the structure direct. They may be on the side walls, buried in the soil, or, when raised benches are used, they may be under these. With both hot-water and steam systems it is especially desirable that the pipes have a uniform grade or fall to insure good circulation. Specially designed heaters with automatic control are now available from manufacturers and have been found to be entirely suitable for the heating of small greenhouses. The installation of a hot-water plant for greenhouse heating is not difficult, but it should be done by someone familiar with the work. It is important that the system be well planned, of adequate capacity, and properly installed so that the circulation will be good and the system free from leaks.

Some Typical Sash Greenhouses

Figure 1 shows the end elevation of a lean-to sash greenhouse 12 feet wide. The natural surface of the ground serves as the beds for growing plants, the walk being excavated to a depth of about 33 inches. This house has a low side wall of concrete about 18 inches above the surface of the ground, and the 2- by 4-inch rafters extend from this to the wall of the supporting building. The rafters have guide strips between each pair of sashes. The lower row of sashes rests directly on the rafters, but the upper row rests on strips nailed to the rafters so that they overlap the lower sashes. The upper row of sashes fits under the edge of the roofing along the supporting building. This arrangement makes it possible to slide the sashes down for ventilation. The roof is supported by a row of posts which rest on the concrete retaining wall along one side of the aisle. The opposite side of the aisle is supported by a similar retaining wall. If desired, the side walls and the retaining walls for the walk may be of lumber.

The material needed for a greenhouse of this kind, with the possible exception of the sashes, may usually be obtained locally at comparatively small cost. This house, as illustrated, if made 50 feet long, requires thirty-two 3- by 6-foot sashes. These cost about $3.50 each, glazed. The sashes are supported by 17 rafters,

each about 14 feet long (usually 2 by 4 inches laid flat), with 32 guide strips, 1 between each pair of sashes. Concrete or lumber for the walls, material for the side, ends, and walls of the beds, and a heating plant are also needed. Rot-resisting lumber, such as cypress or redwood, should be used, but it need not be of an expensive grade. Under favorable conditions a house of this kind with stove or flue heat could be built for about $300. Hot-water heat for such house would require about 300 square feet of radiation, which, with the boiler and fittings, would cost about $200 more. The superior results obtained with the hot-water heat might easily justify the additional cost of this type of heating equipment.

Figure 2 shows the perspective, longitudinal section, and plan of an even-span sash greenhouse 12 feet wide and 27 feet long, with an 8-foot furnace room at one end. The length might be increased to as much as 60 feet, but the greater the length the greater the variation in the temperature within the house, especially when heated by flues, as illustrated. Only general information about the cost of such a structure can be given, because the cost varies widely according to differences in the prices of material and the cost of labor. Frequently it is possible to obtain good used material and thereby greatly reduce the cost. The main items of cost would be the 24 sashes; the rafters and ridge pole; lumber, concrete, or some other material for the walls, ends, and furnace room; and the heating plant. With flue heat as figured the completed house and furnace room should not cost more than $250 to $300. With hot-water heat, the cost would be at least $200 more.

The cost of this type of house would be more than that of the lean-to house of the same size shown in figure 1, because it has more foundation and wall area and must be made entirely self-supporting. However, for most purposes, the type of house shown in figure 2 is best, principally because it has more light and better ventilation.

Figure 3 shows the plan and the end and side sections of an uneven-span sash greenhouse suitable for a sidehill location. The details of an even-span house are similar, varying only in quantities and kinds of materials. The house shown is approximately 18 feet wide and 50 feet long, with one row of sash on the north side of the ridge and two rows of sash on the south side. The walks are excavated to a depth of approximately 33 inches below the natural surface of the ground and have concrete retaining walls, but lumber, bricks, or other material could be used. The end view of the house shows a hot-water heating plant, but flues or stoves could be used. The hot-water pipes are shown on the side walls, but they can also be buried in the soil. The cost of this structure would be somewhat greater proportionately than that of the lean-to house and greater than that of the house shown in figure 2 because of the excavation and walling of two aisles and side walls.

The main items needed for the construction of this house would be 48 sashes, costing about $3.50 each, glazed, and the material needed for the ends, framework, retaining walls, and heating-plant shelter. Ten 2-inch hot-water pipes, or six 8-inch flues, would heat this structure. A boiler having a 20-inch fire pot and a rating of about 1,000 feet would supply the heat. The cost of this structure with flue heat should not exceed $400; with hot-water heat it would

be about $250 more, but the superior results obtained by using hot-water heating might justify its installation.

Details of construction of these houses may be changed to suit conditions. These modifications may involve such changes as the depth of the walks, the height of the side walls, the slope of the roof, or the use of stove or flue heat instead of hot water, or vice versa. The plans are presented merely as suggestions, but these structures as illustrated represent useful kinds of sash greenhouses. Inasmuch as the sash greenhouse is less durable, light conditions are less satisfactory, and it is generally somewhat inferior to a well-built standard sash-bar house, the cost of such structures should always be kept much below that of a sash-bar house of the same size.

Sash greenhouses are more difficult to keep tight than those constructed with regular sash bars, and, in addition, the sash greenhouse has a greater tendency to drip and injure the plants. Sash bars in a regular sash-bar greenhouse have drip grooves that carry off any water that leaks in around the glass. It is almost impossible to putty the glass in the ordinary hotbed sash so as to prevent all leakage.

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